civil and sanitary engineering classes, and metallurgy—for which a laboratory is to be built and a lecturer appointed—will be taken by mechanical engineering students. Botany, biology and microscopy are sciences which have a direct bearing on many of Bradford's industries, and they have also been taken up. The evening classes consist of specialised courses in chemistry and dyeing for advanced students and persons already engaged in trade.

Engineering Department.

The work of the engineering department, which is under Mr. G. F. Charnock, is divided into four sections, viz. (1) civil engineering, (2) mechanical engineering, (3) electrical engineering, and (4) building trades and architecture, the last named being in conjunction with the art department. Some much-needed additions to the machinery are to be made. Several new machine tools have been ordered, and, as opportunity offers, it is intended to substitute the newest examples for all machines of an old-fashioned type. The new syllabus in civil engineering has been framed to meet the requirements of the various professional bodies. A special feature is to be made of sanitary work, and some attention, including laboratory work, will be given to the new methods of sewage treatment. The mechanical engineering department has an increasingly important part to play in the industrial life of Bradford, and by no means the least important part of the work of this department will be to assist in training up a class of men suitable for the position of power superintendent in mills and factories. In the development of new ideas the department has also its place. The systematic study of mechanism and the method of designing mechanical motions would enable many a good idea which would otherwise be lost to its inventor to be worked out to a successful issue Almost every technical school of any note on the Continent and in America has its collection of models systematically arranged to lead up from the simplest motions to the most complicated contrivances, but Bradford as yet can give the inventor no such aid.

Arrangements have been made for the proper teaching of electrical engineering, and a laboratory has been fitted up for practical work.

A room has also been reserved as a mathematical laboratory, and is fitted with apparatus and models to render the teaching as concrete as possible. Special attention is given to the slide rule, and there is a useful collection of measuring instruments. A calculating machine and other similar apparatus have also been provided.

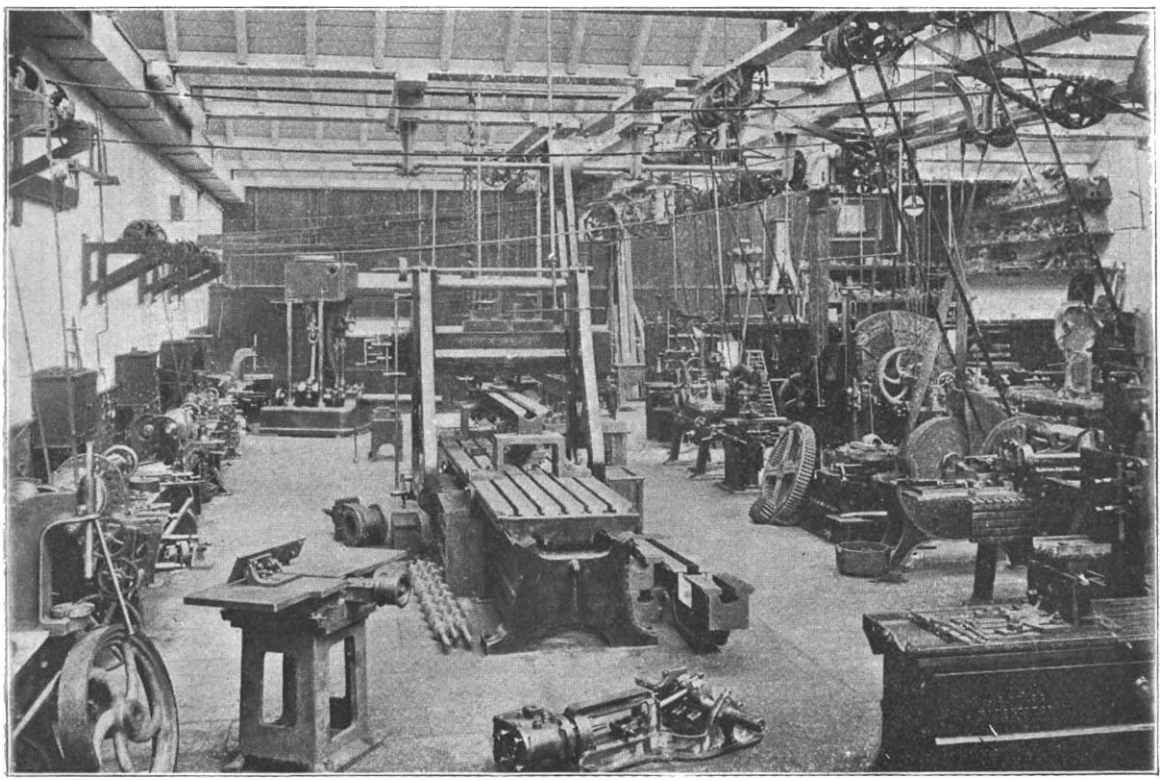

FIG. 3.—Workshop of the Department of Civil and Mechanical Engineering, Bradford Municipal Technical College.

A SUSPENDED RAILWAY.

THE curious railway represented in the accompanying illustration from *La Nature* runs from Vohwinkel to Barmen, through Elberfeld, along the Wupper Valley, in Rhenish Prussia. It is now working regularly, and was to have been formally opened recently by the Emperor of Germany, but the ceremony was postponed on account of the illness of the Empress Frederick. Brief descriptions of the railway have been given in several periodicals, and an illustrated account appears in the October number of the *English Illustrated Magazine*, from which some of the following particulars have been derived.

The total length of the railway is about 8¼ miles, of which more than three-quarters is over the river Wupper. The railway is supported above the river on A-shaped trestles, with the sides rising from each bank, and are placed at intervals of 30 metres. In the highway, along the roads, the supports take the form of an inverted U. The lower part of the latticed girders at the top of the supports contains the rail from which the carriages are suspended. Upon the upper face of this rail runs a two-wheeled truck or trolley containing the electric motors. Two of these trucks, placed nearly thirty feet apart, are supplied to each carriage. From each truck a heavy hook, fastened to the roof of the carriage, projects round the rail, as

shown in Fig. 1. Although the trolley runs on a single rail, it is prevented from falling over by the hook, and also by the fact that the centre of gravity is immediately below the wheels. The railway is a double track, one line for the up and the other for the down trains.

The curve of the track has an average radius of 90 metres; at Vohwinkel, however, there is a curve with a radius of 30 metres, and in one place the radius of curvature is much less than this. At each terminus of the line the track is built in the shape of a large loop, so that the arriving carriages may pass round to the departure platforms. The inclines are slight, the greatest gradient being 4·5 in 100.

The cars are propelled electrically, by current conveyed by means of a sliding contact from generating stations to motors on the trucks supporting the cars. Each truck has a motor of 30 horse-power, and works at a pressure of 600 volts. The cars themselves are about thirty feet long and are of the corridor pattern. There are two cars to a train, and each can carry fifty passengers. No less than nineteen stations are provided in the length of eight miles traversed by the line, and the trains succeed one another every two or three minutes.

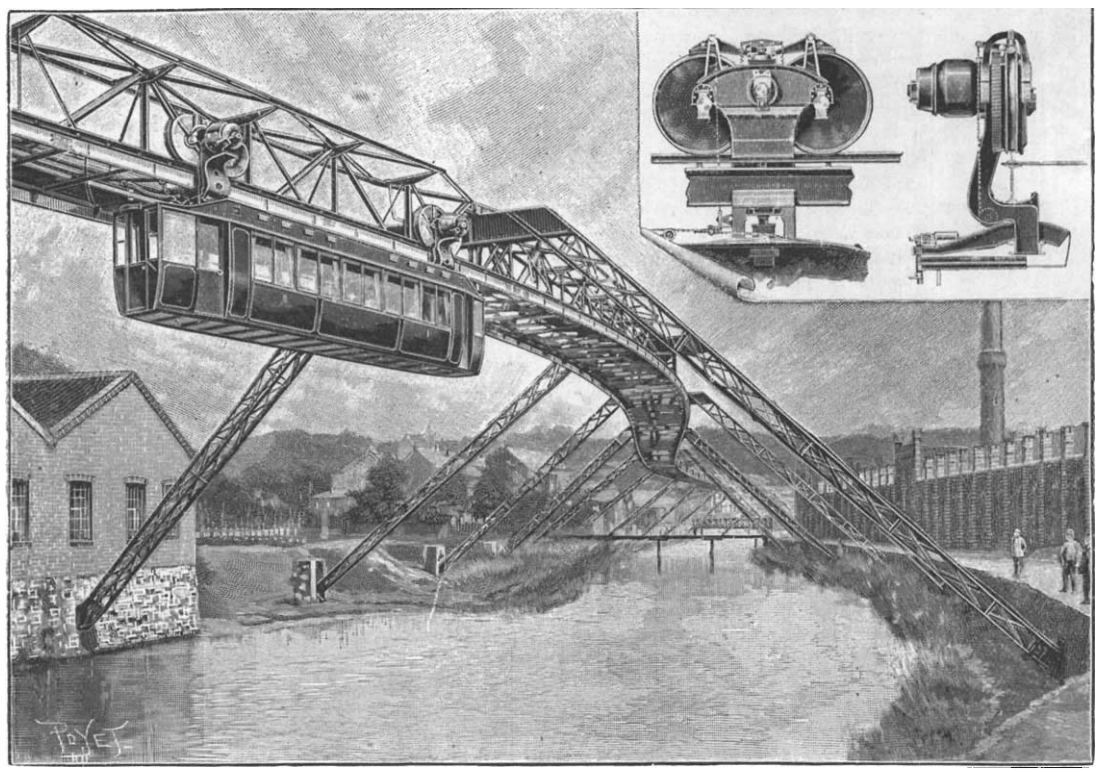

FIG. 1.—General view of a part of the Wupper Valley Railway at Elberfeld. The system of suspension of the trucks is shown in the small figure.

Each car is fitted with a Westinghouse pneumatic brake, a hand brake and an electrical brake, so that it is well under control. The cost of the railway, comprising stations, permanent way, and rolling stock, is stated to have been 56,000*l.* per mile. The proprietor of the railway was Herr Eugene Langen, of Cologne, who died before the line was completed.

OUTPUT AND VALUE OF BRITISH MINERALS.[1]

THE most striking fact recorded in the mineral statistics for 1899 is the enormous output of coal, viz., 220,094,781 tons, showing an increase of 18,040,265 tons compared with the previous year. This country is now producing twice as much coal as it did in 1870, and probably nearly four times as much as in 1850. Durham and Yorkshire together are now yielding about as much coal as the whole of the United Kingdom half a century ago.

The unsatisfactory part of the particulars is the deficiency of detail concerning our most important minerals, coal and iron ore. County outputs are given, but no further descent into local details is permissible, because the Coal Mines Regulation Act prohibits the publication of the individual annual returns. While a statement is made of the output of every little lead or tin mine, it is impossible to state officially which of our colliery companies can be compared, for instance, with such great undertakings as those at Anzin and Lens on the other side of the Channel. Is it wise that no particulars should be kept of the gradual depletion of our great national treasure? The total yearly shrinkage is recorded, but no account is kept in our official statistics of each individual vault which is being drained of its riches.

The Mineral Statistics Committee in 1894 recommended the amendment of the Statute and the publication of the output of individual collieries, but at present nothing has been done. The anomaly involved in the present state of things is specially marked in the case of our iron ores. The law prohibits the publication of the returns of *stratified* ironstone, but allows it in the case of *unstratified* iron ore. Consequently, full details are given of the amount of ore produced by each iron mine in Cumberland, whilst information concerning the output of individual mines in the Cleveland district has to be withheld from publication.

Apart, however, from the question of the production of individual mines, the total output for the year, amounting to more than 220 million of tons and showing an increase of about 9 per cent. on the output for the previous year, points to the urgency which the question of the exhaustion of the coal supply is rapidly assuming. While it is impossible, in an annual report on the mineral output, to undertake the task of estimating the amount of coal still remaining in the British Isles, and of attempting to arrive at any conclusion as to the time that may elapse before its exhaustion begins to be felt, it may perhaps not be out of place to call attention to the practical importance of

[1] Reprinted from a report by Prof. Le Neve Foster, F.R.S., on the output and value of the minerals raised in the United Kingdom in 1899, the amount and value of the metals produced, and the exports and imports of minerals. Published by the Home Office.